

Crop Nutritional Needs


By A.M. Johnston and N.R. Usherwood

Agriculture's greatest challenge is to continue to increase crop yields per unit of land farmed to meet the food requirements of a growing world population. It is no secret that proper nutrient management has been and continues to be critical to advances in crop production. Understanding site-specific nutrient requirements and optimum rate, time, and method of nutrient application is essential for improving crop yield, quality, and profitability while protecting the environment.

Yields have increased significantly in North America during the past 40 years. For example, from 1961 to 2000, average corn yields increased 1.9 bu/A per year in the U.S. and 1.1 bu/A per year in Canada. Wheat yields increased 0.4 bu/A per year in both the U.S. and Canada. As crop yields increase, so do nutrient requirements. Soils must be fertile to meet the growing-

With improved yields, removal of nutrients has increased. Effective and efficient resupply of nutrients requires access to reliable information about crop yield levels, nutrient requirements, and nutrient removal.

season demands of a high yielding crop. Research has shown that in a particular season under optimum growing and response conditions, recovery of applied nutrients can be as high as 70 percent for nitrogen (N), 20 percent for phosphorus (P), and 30 percent for potassium (K). Much of the unused nutrients will be available for subsequent crops, but the fact remains that soils must be high in soil fertility to keep nutrient supply from being a yield-limiting factor.

By utilizing uptake values and crop yields, it is possible to estimate nutrients removed from the field by harvested crops. Nutrient removal estimates for North American crop classes are presented in **Table 1**. Crops remove approximately 19, 7, and 11 million tons of N, P₂O₅, and K₂O, respectively, each year from the fields of North America. Forages are responsible for over one-fifth of the P removal and half the K removal by all crops. The high level of nutrient removal by forage crops underscores the importance of nutrient replacement to maintain high yields and quality of the forage stand. 

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TABLE 1. Nutrient removal by major crops in the U.S. and Canada.

Crop type	N	P ₂ O ₅	K ₂ O	N	P ₂ O ₅	K ₂ O
 Million tons Million tons Million tons % of total % of total % of total
U.S. (1998-2000 avg)						
Field crops	11.9	4.4	4.4	74	76	46
Forage crops	3.7	1.2	4.7	23	22	49
Specialty crops	0.4	0.1	0.5	3	2	5
Total	16.0	5.7	9.6	100	100	100
Canada (2000)						
Field crops	1.9	0.7	0.6	77	81	46
Forage crops	0.6	0.2	0.7	23	19	54
Total	2.5	0.9	1.3	100	100	100